

WHAT IS CLAIMED IS:

1. A process for converting a first linear alpha olefin having carbon number n to ethylene and a second linear alpha-olefin having carbon number $2n - 2$, wherein $2n - 2$ is greater than n , said process comprising:

- (a) subjecting a feed including said first linear alpha-olefin having carbon number n to catalytic metathesis under conditions and with a metathesis catalyst that minimizes isomerization of said feed to produce an effluent comprising ethylene and an internal olefin having carbon number $2n - 2$;
- (b) fractionating said effluent from step (a) into a first stream containing said internal olefin having carbon number $2n - 2$ and a second stream including unreacted first linear alpha olefin and an internal olefin having carbon number $2n - 3$;
- (c) subjecting said first stream including said internal olefin having carbon number $2n - 2$ to isomerization to convert said internal olefin having carbon number $2n - 2$ to said second alpha olefin having carbon number $2n - 2$;
- (d) subjecting said second stream of step (b) to metathesis; and
- (e) combining the effluent from step (d) with said effluent of step (a); and
- (f) subjecting said effluent from step (d) and effluent of step (a) to fractionation in

step (b).

2. The process of claim 1 wherein said second stream containing said unreacted first alpha olefin and said internal olefin having carbon number $2n - 3$ is subjected to additional metathesis by recycling said second stream to step (a).

3. The process of Claim 1 wherein the first linear alpha olefin is butene-1, the second linear alpha olefin is hexene-1 and said internal olefin having carbon number $2n - 2$ is a C_6 internal olefin, and said linear internal olefin having carbon number $2n-3$ is pentene.

4. The process of Claim 3 wherein the feed is comprised of at least 90% of butene-1.

5. The process of Claim 3 wherein said catalyst is selected from the group consisting of tungsten oxide, molybdenum oxide, rhenium oxide, and mixtures thereof.

6. The process of Claim 5 wherein said catalyst is tungsten oxide.
7. The process of Claim 6 wherein said catalyst is supported tungsten oxide.
8. The process of Claim 1 wherein the metathesis is effected at a WHSV of from about 3 to about 200.
9. The process of Claim 8 wherein said metathesis is effected at a WHSV of from about 6 to about 40.
10. The process of Claim 1 wherein said metathesis is effected at a pressure of from about 10 psig to about 600 psig.
11. The process of Claim 10 wherein said metathesis is effected at a pressure of from about 30 psig to about 100 psig.
12. The process of claim 1 wherein said metathesis is effected at a temperature from 250° to 400° C
13. The process of Claim 6 wherein said catalyst is supported on a silica support.
14. The process of Claim 3 wherein said C₆ internal olefin is isomerized to hexene-1 at a WHSV of from about 3 to about 200.
15. The process of Claim 14 wherein said C₆ internal olefin is isomerized to hexene-1 at a pressure of from about 2 bar to about 40 bar.
16. The process of Claim 15 wherein said C₆ internal olefin is isomerized to hexene-1 at a pressure of from about 3 bar to about 10 bar.

17. The process of Claim 3 wherein said C₆ internal olefin is isomerized to hexene-1 at a temperature of from about 40°C to about 400°C.

18. The process of Claim 17 wherein said C₆ internal olefin is isomerized to hexene-1 at a temperature of from about 250°C to about 350°C.

19. A process for producing ethylene and hexene-1 from a mixed C₄ feed containing butene-1, butene-2, butadiene, and isobutylene, comprising:

- (a) removing butadiene;
- (b) hydroisomerizing butene-1 to butene-2;
- (c) separating isobutylene from other butenes;
- (d) isomerizing butene-2 from step (b) to butene-1;
- (e) subjecting butene-1 from step (d) to catalytic metathesis under conditions and in the presence of a metathesis catalyst that minimizes isomerization to produce an effluent including ethylene, pentene-2, and hexene-3, and wherein said pentene-2 is recycled to said butene-1 produced from step (d) to be subjected to said catalytic metathesis;
- (f) fractionating the effluent; and
- (g) isomerizing hexene-3 from step (e) to produce hexene -1.

20. The process of Claim 1 wherein said catalyst does not include a promoter.

21. The process of Claim 19 wherein said catalyst does not include a promoter.